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(54) A seating structure

(57) A seat structure is disclosed which mounts on a horizontal rail 3. The seat structure has a backrest 6 and a pivoted tip-up seat 7 mounted on a bifurcated yoke 9. The backrest is supported by the pair of limbs on which the seat is pivoted. Armrests are independently mounted on the rail. The seat structure may also be pivotally mounted on the rail so that it can fold forwardly or backwardly to an out-of-use position and/or be directly mounted on retractable tiers to provide retractable seating. The structure finds use in seating for stadia, auditoria, theatres etc.

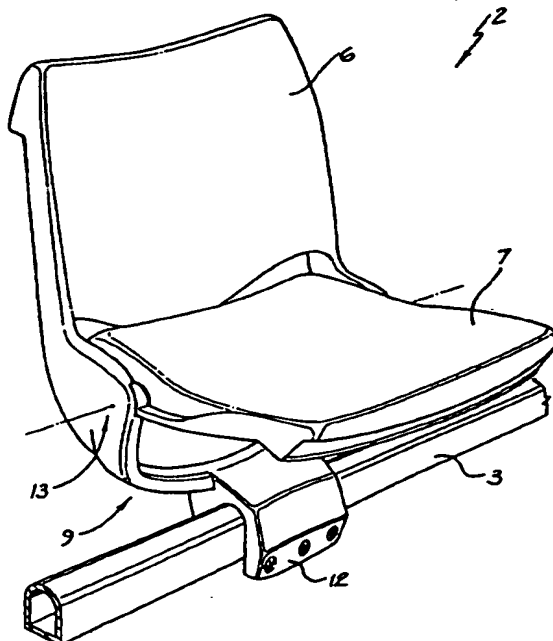


FIG. 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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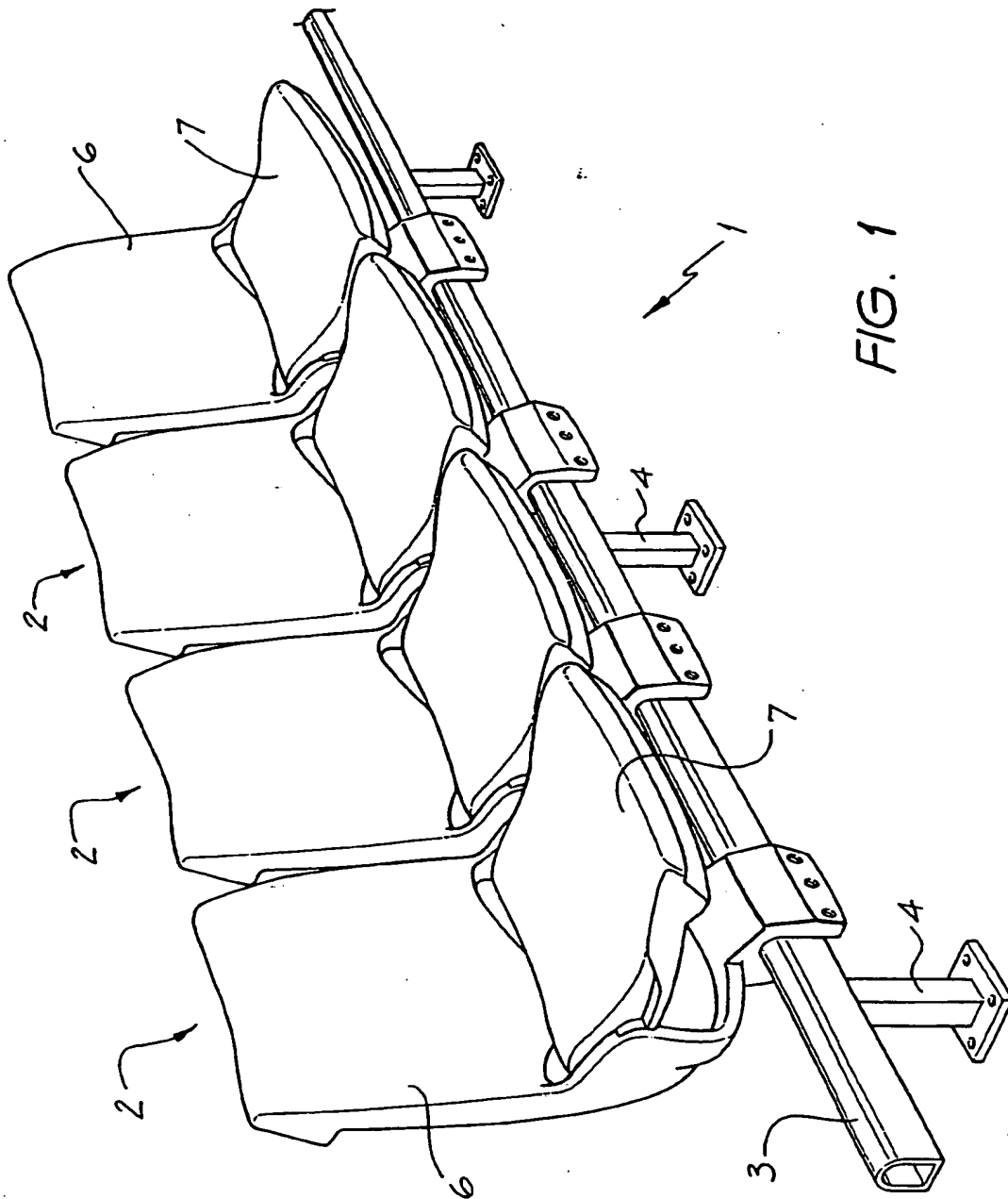


FIG. 1

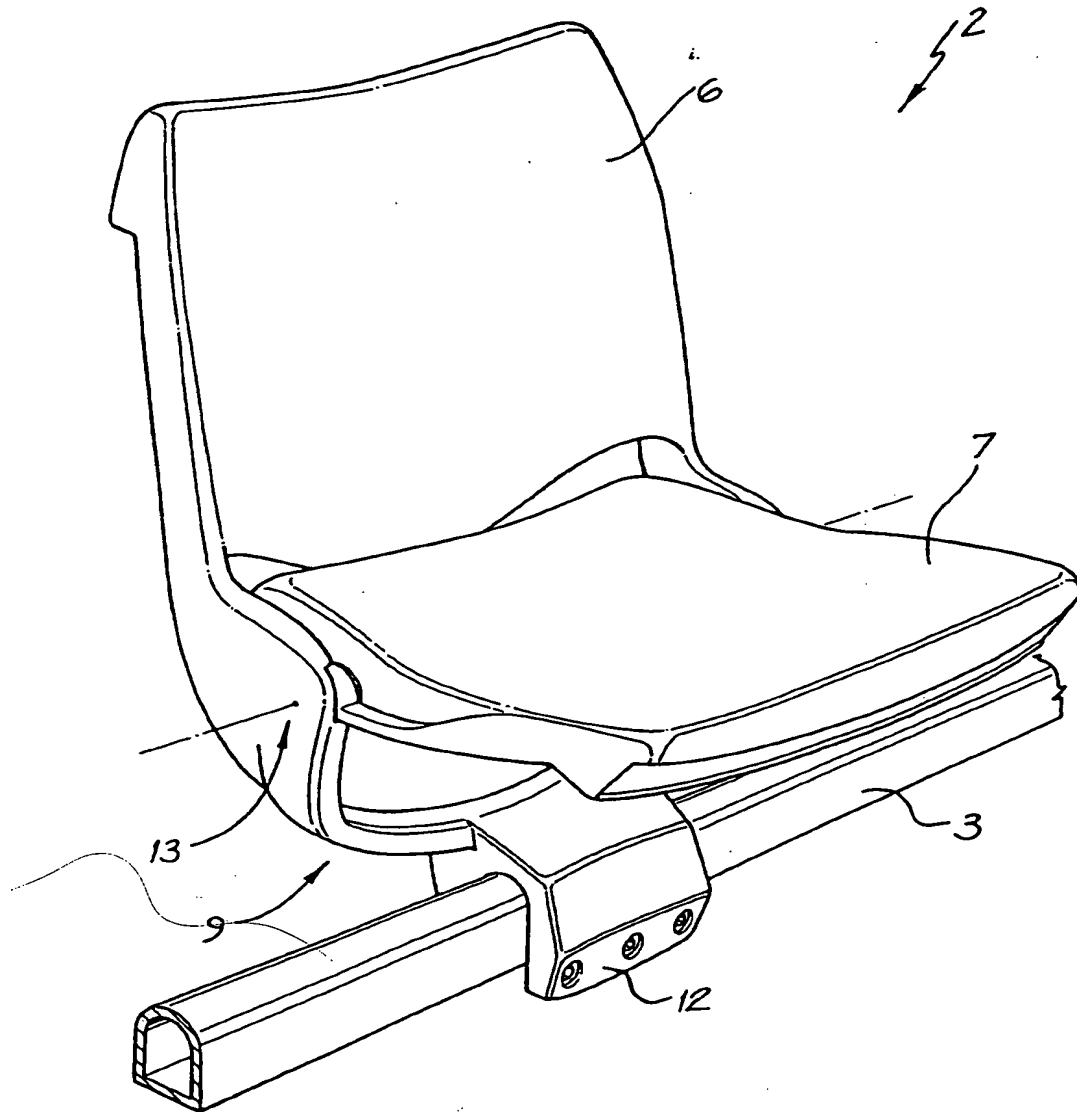


FIG. 2

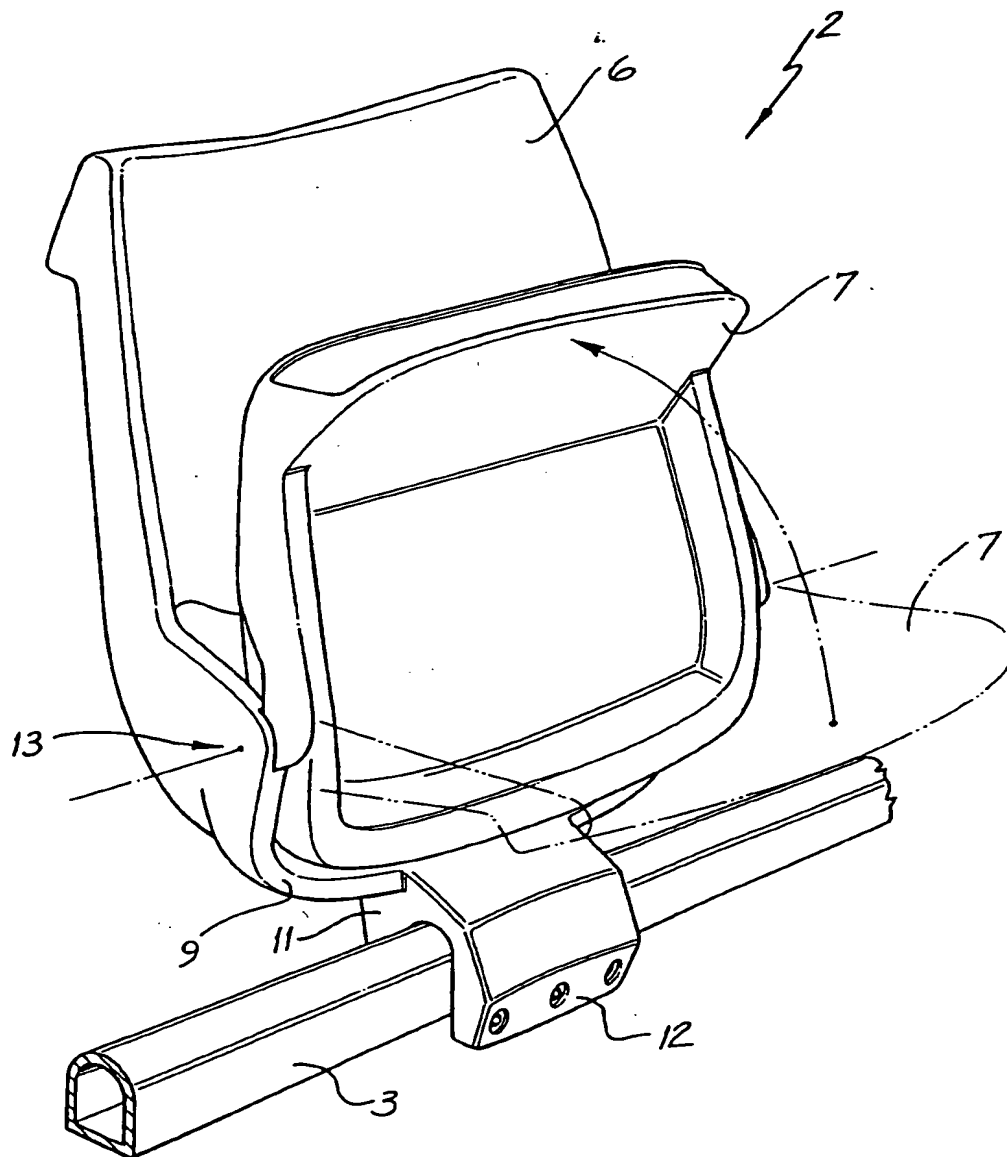


FIG. 3

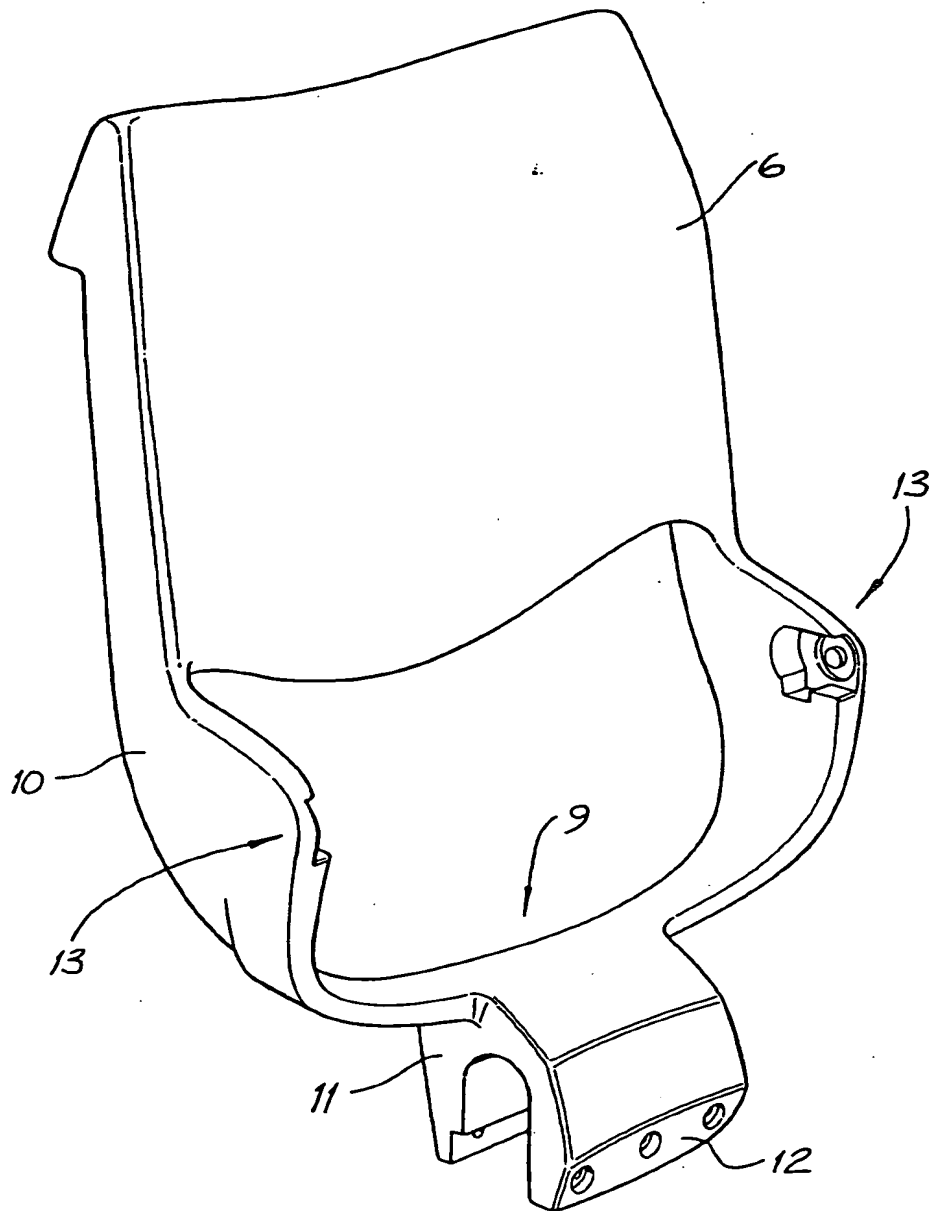


FIG. 4

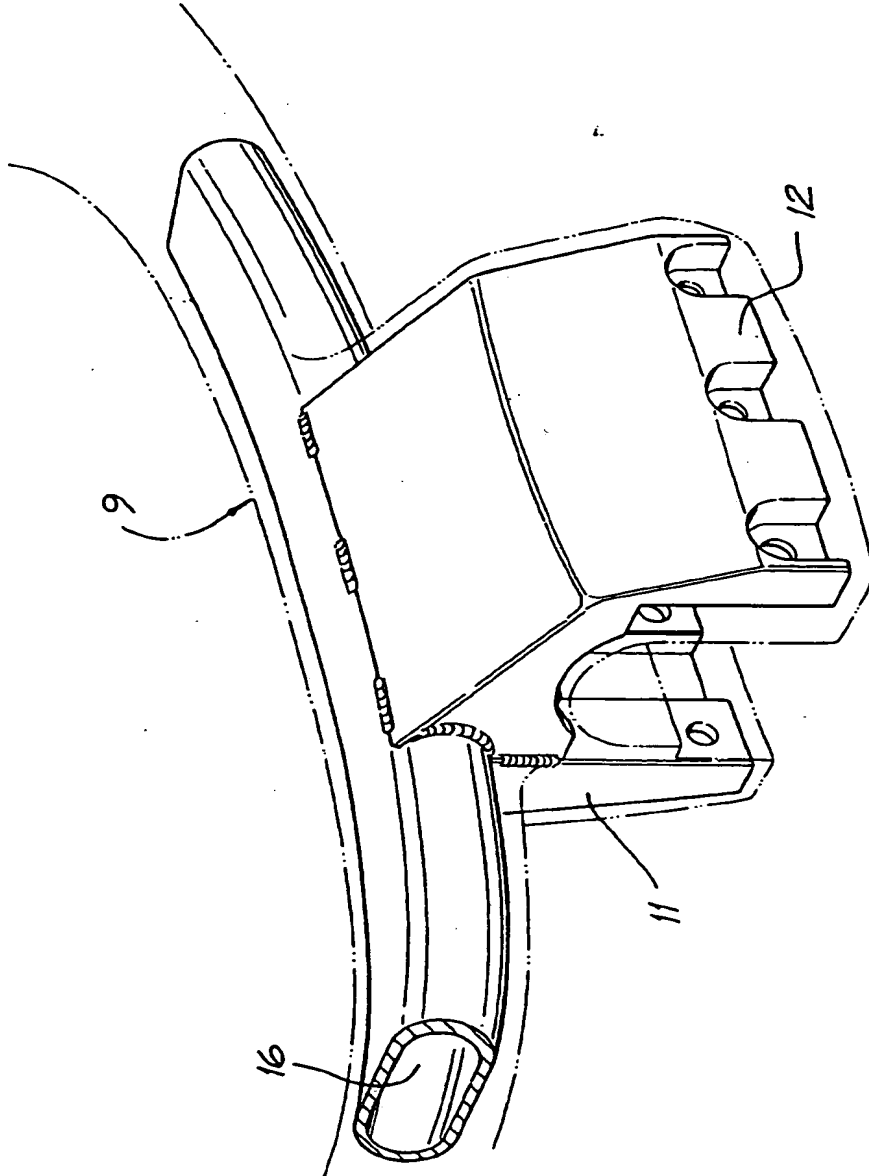


FIG. 5

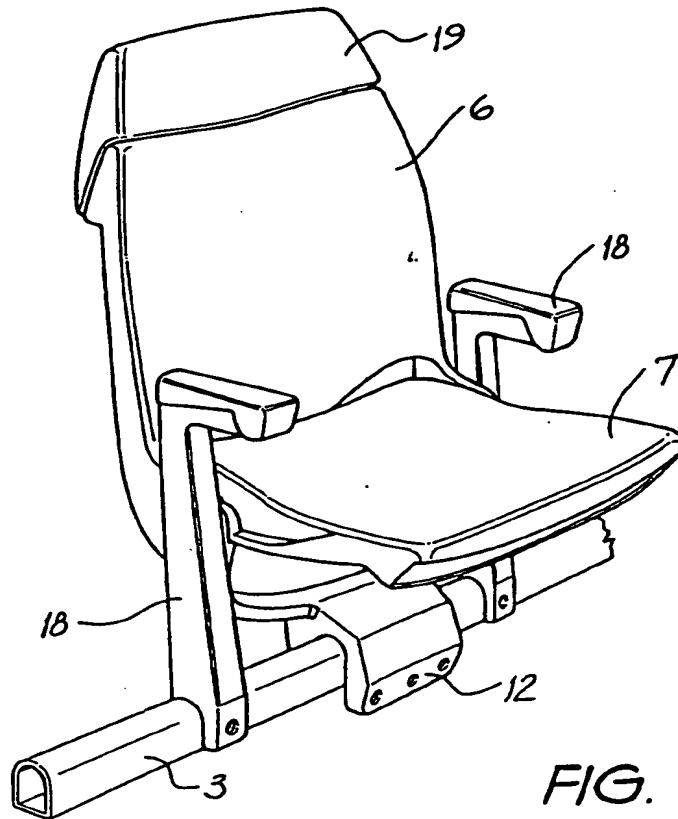


FIG. 6

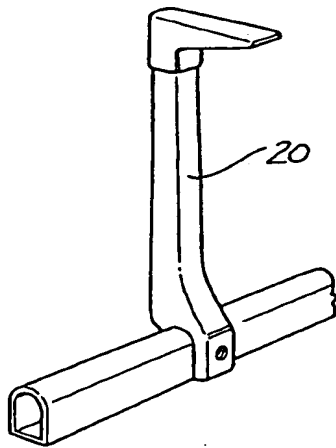


FIG. 7

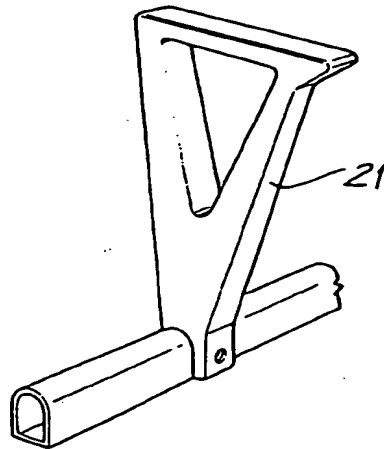


FIG. 8

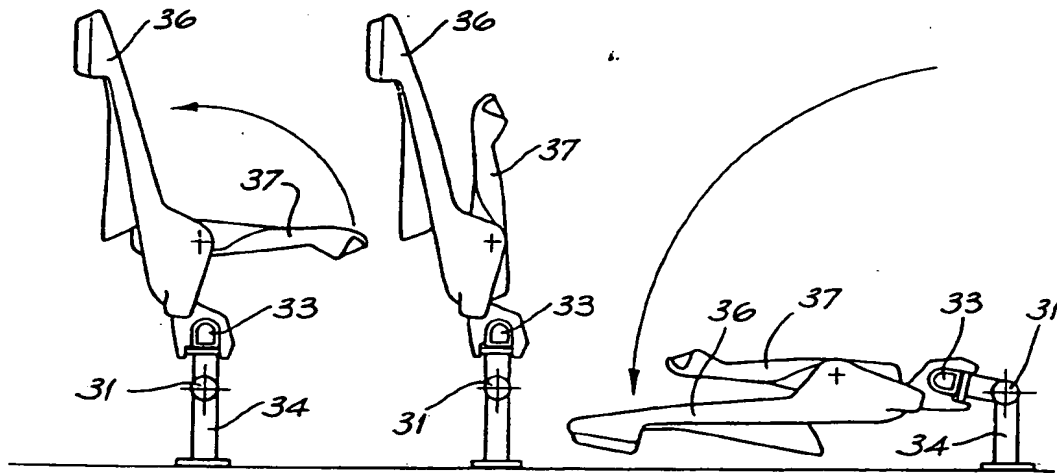


FIG. 9

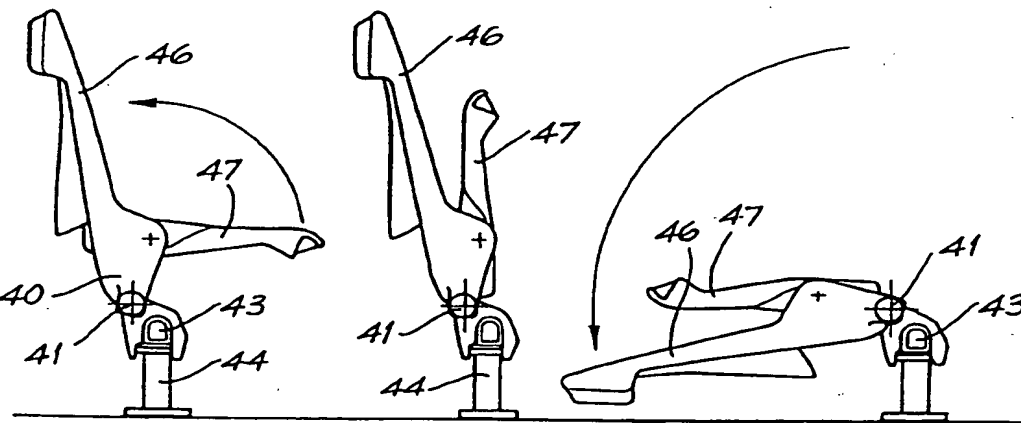


FIG. 10

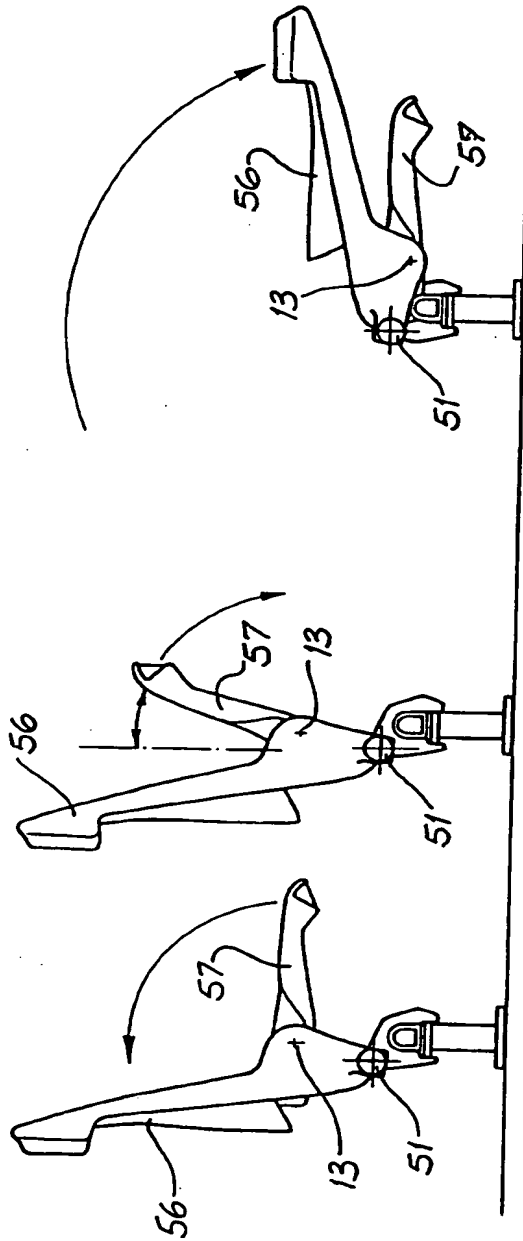


FIG. 11

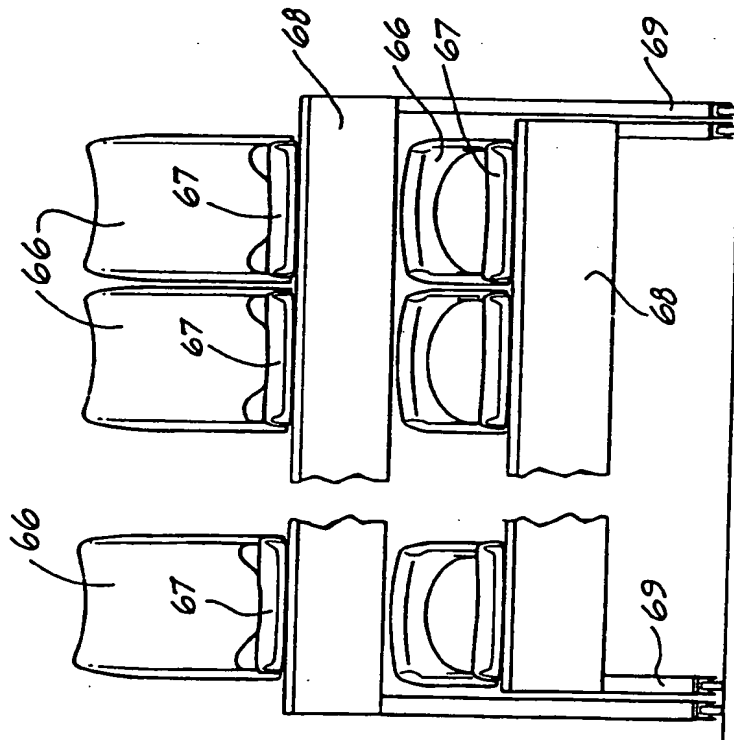


FIG. 12

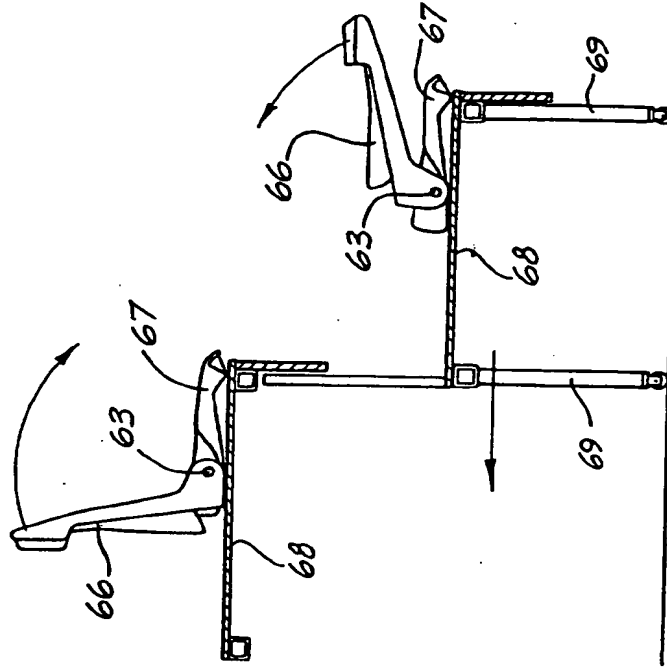


FIG. 13

A SEATING STRUCTURE

5 The present invention relates to seat structures and, in particular to a seat structure suitable for use in stadia, auditoria, theatres and the like. Generally such seat structures are adapted to be mounted on a horizontally extending rail, spline, or like support.

In such seat structures the position of the rail determines the location of the rows. The seat structure is formed from a backrest and a seat with the seat being pivotal between a substantially horizontal use position and a substantially vertical access position. The front to rear distance between adjacent rails determines the inter-row spacing and the seats are pivotal into the vertical position in order to permit people to walk along the rows.

In one type of prior art seat structure, the backrest is directly mounted to the rail and each backrest is positioned between a pair of armrests. Each pair of armrests is directly clamped to the rail. Extending between each pair of armrests is a horizontal axis about which the seat pivots. Examples of this prior art type of seat include that sold by the applicant under the Registered Trade Mark PERFORMA.

15 In a second type of prior art seat structure, the backrest is again clamped directly to the horizontal rail, however, the clamping mechanism includes a pivot or hinge which pivotally mounts the seat. If armrests are required these are independently provided and one armrest clamps to the rail on each side of the seat structure. Examples of this type of seat include models TS-8002 and TS-8003 sold by KOTOBUKI of Japan and models nos. BLM2173A and BLM2273A also sold by KOTOBUKI of Japan.

25 A third type of prior art chair is a single pedestal mounted seat structure, rather than a rail mounted seat structure. Here a generally Y-shaped frame is provided with the stem of the Y being mounted directly on the floor, the upper ends of the arms of the Y providing a support for horizontally extending armrests, the rear ends of the armrests being joined by a horizontally extending band to which the backrest is connected, and the seat being pivotally mounted on a horizontal axis which extends

from approximately the mid points of the arms of the Y. Examples of this type of seat structure include model 62-63 manufactured by J G FURNITURE SYSTEMS INC. of the USA and model TS 3637 sold by KOTOBUKI of Japan.

5 All of the above described prior art seat structures suffer from various disadvantages. The third type, the single pedestal chair, is most wasteful of front to rear distance when the seat is in the vertical position. The second type requires a very strong, and therefore expensive, hinge since the seat is essentially pivoted from a very short axle and therefore is prone to be damaged by twisting. The second type of prior art seat structure does, however, have the advantage that the armrests are optional.

10 Both the first and third type of seat structure suffer from the disadvantage that the armrests are obligatory since it is the armrests which provide the support for the seat axis. However, since the seat is provided with two pivot points lying in a horizontal axis, the pivoting arrangement for the seat is both strong and able to be provided in a low cost manner.

15 It is the object of the present invention to provide an alternative seat structure to the prior art seat structures described above and in which, in particular, the seat is not pivoted between the armrests thereby enabling the provision of armrests to be optional.

20 According to the present invention there is disclosed a seat structure adapted to be mounted on a horizontally extending rail or like support and having a seat pivotal between a substantially horizontal use position and a substantially vertical access position, said seat structure comprising a bifurcated yoke having a pair of limbs and a stem, each of said limbs extending upwardly to form one of a pair of opposite sides of a backrest, said stem forming at least part of an attachment means to mount said seat

25 structure on said rail, and said seat being pivoted on an axis extending between said limbs of said yoke.

Several embodiments of the chair of the present invention will now be described with reference to the drawings in which:

Fig. 1 is a perspective view of a rail mounted row of seats in accordance with a first embodiment of the present invention, no armrests being provided,

Fig. 2 is a front perspective view of one of the seat structures of Fig. 1 with the seat being illustrated in the substantially horizontal position,

5 Fig. 3 is a view similar to Fig. 2 but showing the seat raised into the substantially vertical access position,

Fig. 4 is a view similar to Figs. 2 and 3 but showing the backrest and yoke with the seat absent,

Fig. 5 is a perspective view of the clamping arrangement which supports the
10 seat structure on the rail,

Fig. 6 is perspective view of a seat of a second embodiment having a headrest extension on the backrest and being provided with optional armrests,

Figs. 7 and 8 are each perspective views of arm rests of further embodiments,

Fig. 9 is comprised of three side elevational views of a first embodiment of a
15 rail support system suitable for retractable seating,

Fig. 10 is a view similar to Fig. 9 but showing an alternative arrangement for retractable seating,

Fig. 11 in a view similar to Figs. 9 and 10 but showing still further arrangements,

20 Fig. 12 is a truncated front view of a partially extended still further retractable seating embodiment, and

Fig. 13 is a front to rear longitudinal cross-section through the arrangement of Fig. 12 when fully extended.

As seen in Fig. 1, a row 1 of seat structures 2 is formed by mounting a
25 number of the seat structures 2 on a horizontally extending rail 3. The rail 3 can be supported at regular intervals by columns 4 which are mounted in conventional fashion from the horizontal surface, or tread, of a stepped auditorium floor (not illustrated). Alternatively, the rail 3 can be supported by arms inclined from the vertical and which

extend from the vertical riser surfaces of the stepped auditorium floor, this well known arrangement not being illustrated in the drawings.

It will be seen from Figs. 2 and 3 that each of the seat structures 2 takes the form of a backrest 6 and a seat 7 with the seat 7 being pivotal between a substantially horizontal use position illustrated in Fig. 2 and a substantially vertical access position illustrated in Fig. 3.

As best seen in Fig. 4, a bifurcated, or forked yoke 9 is provided which has a pair of limbs 10 and a stem 11. The stem 11 essentially comprises a clamp 12 by means of which the yoke 9, and thus ultimately the entire seat structure 2, can be supported on the rail 3. The limbs 10 extend upwardly to form the sides of the backrest 6. In addition, each limb 10 carries a pivot 13. The horizontally aligned pivots 13 enable the seat 7 to be pivotally mounted between the limbs 10. Full details of the preferred form of the pivot arrangement are provided in the present applicant's co-pending patent Application No. PN3766 (Attorney Reference: 306258) entitled A PIVOT MECHANISM, the contents of which are hereby incorporated by cross-reference.

Turning now to Fig. 5, the details of the manufacture of the stem 11 of the yoke 9 are illustrated. Preferably the entire backrest 6 and yoke 9 is able to be injection moulded in a single step utilising the air moulding technique known per se which enables the limbs 10 to be hollow as indicated at 16 in Fig. 5. The seat 7 is also preferably formed by injection moulding using the air mould technique. Such an arrangement enables substantial strength to be achieved whilst also simultaneously achieving light weight and economy of material.

In Fig. 6 a further embodiment of the chair of the present invention is illustrated having a pair of individual armrests 18 each of which is able to be independently clamped to the rail 3 and neither of which in any way supports the backrest or seat. In addition, the seat structure illustrated in Fig. 6 also includes an optional headrest 19 (or backrest extension) which is able to be secured to the backrest 6. Figs. 7 and 8 illustrate alternative forms of armrests 20 and 21.

In some auditoria there is a demand for so-called "retractable seating". This seating is particularly useful where the stage area is varied. Thus for various performances which require a small stage area, the floor space available for the audience can be increased and extra seating provided in this floor space. In order to
5 accommodate performances which require a larger stage area, this seating is able to be retracted when not required.

Such retractable seating has each rail mounted on a corresponding one of a series of pull-out drawers which are akin to the drawers of a chest of drawers, save that the drawers when fully extended form a stepped arrangement with each adjacent rail
10 being located on a progressively higher level of the stepped drawers. In order to permit the drawers to be retracted it is necessary that the entire seat structure be able to be folded downwardly so as to lie in a substantially horizontal position.

Fig. 9 illustrates a first mechanism for achieving this in accordance with the chair of Figs. 1-8 by utilising a pivot 31 located in each of the columns 34 which
15 support the rail 33. In order to progress from the seated configuration to the folded down configuration one moves from the left hand drawing in Fig. 9 to the right hand drawing. The seat 37 is initially moved into the vertical position adjacent the backrest 36 to place the seat structure in the configuration illustrated in the centre drawing of Fig. 9. The entire rail 33 is then moved about the pivot 31 so as to place the adjacent
20 seat 37 and backrest 36 in the substantially horizontal position illustrated in the right hand drawing of Fig. 9. It will be appreciated by those skilled in the art that the pivot 31 can also be moved in the opposite direction from that illustrated in Fig. 9 so as to place the backrest 36 above the seat 37, not under it as illustrated in Fig. 9. That is to say, the seat structure can be pivoted forwardly, rather than rearwardly as illustrated.

25 Fig. 10 illustrates an alternative arrangement for achieving the necessary pivoting action in order to utilise retractable seating. Here the seat 47 and backrest 46 are as before and are again mounted on a rail 43. However, the limbs 40 are each provided with a pivot 41. In this arrangement the rail 43 remains unpivoted whilst the seat 47 and backrest 46 turn about the pivot 41. In the illustrated arrangement of the

right hand drawing of Fig. 10 the seat 47 is above the backrest 46, the arrangement being pivoted to the rear. It will be apparent to those skilled in the art that the pivot 41 can also move in the opposite direction so as to pivot the seat 47 and backrest 46 forwardly so that the backrest 46 lies above the seat 47.

5 Preferably the retractable seat arrangement of Figs. 9 and 10 is modified so that the seat 37, 47 is spring loaded and therefore rises into the substantially vertical position whenever a person is not sitting on the seat. However, there is a problem which can be created if an excited audience member jumps to his feet, only to find that unbeknown to the audience member the seat has risen beneath him. Thus, when the
10 audience member again sits down he misses the seat and inadvertently slumps heavily toward the floor. In order to prevent this problem arising, the arrangement illustrated in Fig. 11 is provided. Here the backrest 56 is essentially as before, however, the pivots 13 include a block of resiliently compressible material (such as rubber or other elastomer) which restricts the arc through which the seat 57 rises upwardly. Thus the
15 seat 57 comes to rest at an angle forward of the vertical, typically by 15-30°. Under these circumstances, if an excited audience member jumps to his feet, when that audience member resumes his seat the buttocks of the audience member will contact the front edge of the seat 57 thereby returning the seat 57 to the substantially horizontal position as the audience member resumes a sitting position. In this way the possibility
20 of an accident is avoided.

 However, because the resiliently compressible material (not illustrated) is able to be compressed beyond its initial position by being subjected to an adequate force, by folding the backrest 56 forwardly as illustrated in Fig. 11, the backrest 56 can be placed in a substantially horizontal position which is low enough to permit retractable
25 seating to be used. Thus retractable seating can be used even though yet the seat 57 does not approach the vertical by upto 15- 30° as illustrated in the middle drawing of Fig. 11. This ensures a safe arrangement even though retractable seating is used.

 In Figs. 12 and 13 a still further embodiment is illustrated. Here the backrests 66 pivot at 63 in relation to the seats 67. The seats 67 are directly mounted on trays

68. Each tray 68 is mounted on wheeled legs 69 so as to be reciprocated to the left or right as seen in Fig. 13. Fig. 13 illustrates the fully extended tray position, and is retractable by pushing to the left as seen in Fig. 13. In Fig. 12 the lower tray 68 is retracted.

The backrests 66 are able to be pivoted in the anticlockwise direction as seen in Fig. 13 when the corresponding tray 68 is extended. Prior to retracting a tray 68, the backrests 66 of the seats 67 mounted on that tray 68 are pivoted in a clockwise direction as seen in Fig. 13. This enables the backrests 66 of each lower tray to pass under the tray immediately above.

The main advantage of this embodiment is to reduce the height between adjacent trays.

The foregoing describes only some embodiments of the invention and modifications, obvious to those skilled in the art can be made thereto without departing from the scope of the present invention.

Each feature disclosed in this specification (which term includes the claims) and/or shown in the drawings may be incorporated in the invention independently of other disclosed and/or illustrated features.

The appended abstract as filed herewith is included in the specification by reference.

CLAIMS

1. A seat structure adapted to be mounted on a horizontally extending rail or like support and having a seat pivotal between a substantially horizontal use position and a substantially vertical access position, said seat structure comprising a bifurcated yoke having a pair of limbs and a stem, each of said limbs extending upwardly to form one of a pair of opposite sides of backrest said stem forming at least part of an attachment means to mount said seat structure on said rail, and said seat being pivoted on an axis extending between said limbs of said yoke.
2. A seat structure as claimed in Claim 1 wherein said axis is positioned on said limbs below the lower edge of said backrest.
3. A seat structure as claimed in Claim 1 or 2 wherein said axis is positioned forwardly of said backrest.
4. A seat structure as claimed in any one of Claims 1 to 3 and including one armrest or a pair of armrest, the or each armrest being located to one or a corresponding one of the sides of said seat structure and being independently supported on said rail or like support.
5. A seat structure as claimed in any one of Claims 1 to 4 wherein said rail or like support is pivotally mounted to permit said seat structure to be pivoted.
6. A seat structure as claimed in any of Claims 1 to 4 wherein the stem of said yoke is pivotable relative to said attachment means to permit said seat structure to be pivoted.
7. A seat structure as claimed in Claim 6 wherein said seat structure is pivotable to the rear to locate said backrest below said seat.
8. A seat structure as claimed in Claim 6 wherein said seat structure is pivotable to the front to locate said backrest above said seat.
9. A seat structure as claimed in any one of Claims 1 to 8 wherein said stem is attached directly to a retractable tray.
10. A seat structure as hereinbefore described with reference to the accompanying description, drawings or description and drawings.